A Case study on water-saving in agriculture and transfer of water right in the Northwestern Region of China

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1. Preface

As we all know, the Northwestern Region of China is the arid and semi-arid areas. It has scarce water resources and a relatively weak social economy. With agriculture as the leading industry and the extensive water resources usage, the water used in agriculture is wasteful and inefficient. As the implementation and promotion of "Western China Development" policy continues and the rapid development of the social economy, the demand for water is continuously growing, which aggravates the shortage of water resource. At the same time, the environmental problems caused by water shortage in the Northwestern Region of China are increasingly serious. The importance of environmental water consumption is strengthened continuously. So, it's an important question in water management to solve the water use conflict among agriculture, industry and the ecosystem.

Agricultural water use in the Northwestern Region is inefficient and its proportion in the total water consumption is high (above 80%). So the current water use structure should be changed, which is water re-allocation.

There are two ways to re-allocate water. The first is cutting water usage forcibly, and the second is transfer of water rights. These two ways need the agriculture water saving to support them. In order to minimize the influence of reducing water use in agriculture, government advocates agricultural water saving from the end of the 1970's, and began to improve the capital sustained in agriculture in recent years.

2. Rearrange of the conceptions

2.1 Structure of agricultural irrigation system

Mr. Zhicun Bokang thinks that the agricultural irrigation system is made of Social system (software) and Facilities system (hardware). These concepts classify the water management organization, water pricing, water rights into software, and water source project, irrigation canal project, field works, and water saving equipments into hardware.

2.2 Approaches of agricultural water-saving

Agricultural water-saving can be divided into water saving in water transportation and in the field. Water-saving in transportation can be implemented through canal lining, prevention of watergate leakage, rotational irrigation enforced by the government and irrigation district. Water-saving in the field can be implemented through adjusting agricultural structures, planting water-saving crops, using micro irrigation equipment, and field water management by farmers.

Agricultural water-saving and adjusting water use structures is a systems engineering. It needs the software and hardware to work together. And it can come to realization only with the participation of government, irrigation districts and farmers.

3. Agricultural water-saving and water rights transfer in Inner Mongolia of the Yellow River basin

3.1 General situation

In Inner Mongolia', agricultural water use occupies 95% of the total water consumption, and the proportion of industrial water is 3% only. Water efficiency of canal systems is only 0.4; Gross irrigation quota is 15000 m^3/hm^2 (2.4 times of the average of China). Water efficiency is very low. But recently Inner Mongolia has a high level of economic growth. For example, the economic growth rate is more than 10% and GDP had reached $3000 per person in Endos. It's forecasted that Inner Mongolia's industrial water use rate will reach 10% of the total in 2010.[1]

Because the policy of *Integrated River Basin Management has been* strengthened in recent years, the Yellow River Conservancy Commission (YRCC) has regulated the water-intake management, and distributed the volume of water to the 9 provinces along river (so called 87 schemes). Because Inner Mongolia's water-intake exceeds that of the allocated water, there is no new water supply satisfy the industry and other profession's new water demands——the only way is water rights transfer.

3.2 The Inner Mongolia's water re-allocation

3.2.1Cutting water usage forcibly

As we all know, the volume of water distributed to Inner Mongolia is 5.86 billion m^3. In fact, Inner Mongolia has exceeded the allocated water for many years. The mean annual volume of water-intake of Hetao irrigation district (ID) is 5.32 billion m^3, taking up 91% of the quota for whole province. YRCC permitted water-intake of Hetao ID is 4.4 billion m^3 (2000-04)[2]. So, YRCC cut forcibly to Hetao ID for its past mean annual volume of water-intake, that is to say, the unreasonable usage can't be recognized as original water rights. Hetao ID must improve the water efficiency, and reduce the water conveyance loss.

3.2.2 Agricultural water saving

In order to save water, the irrigation district should reform the facilities system and management system, and raise the water price (Two Reforms and One Raise).

1) Reform of the facilities system

From 1998 to 2005, country and local government used 486 million Yuan for the facilities system rebuilding, the canals lining, building and rebuilding hydraulic structures, etc[3]. As a result, water efficiency of canal system increased by 0.156.[4]

2) Management system reform

Water Users' Associations (WUAs) are set up to let farmers manage the sublaterals canals. It raises farmer's enthusiasm to manage the field.

3) Raising the water price

Hetao ID raised the water price from 0.0017 Yuan/m^3 of 1995 to 0.04 Yuan/m^3 of 1999 step by step.

The measures had received evidence of effectiveness. From 1987 to 2002, the irrigation area increased 70 thousand hm^2; double cropping area increasing 1 thousand hm^2; the water-intake from the Yellow River decreased from 57 billion m^3 to 50 billion m^3 in recent years [3].

3.2.3 Transfer of water rights

In order to satisfy its new water demand, industrial enterprises can invest into agricultural water saving. Industrial enterprises use the saved water through building water saving projects.

Under the approval of YRCC and local water department, a water rights transfer contract is signed after negotiation. The contract includes the transfer volume and compensation, the specific content about water saving project and the time limit of transfer. Agricultural water saving projects rely on national investment and are always short of funds. Investments from industrial enterprises solve the fund problem. Water rights transfer also supplied the most basic element of industry production——water. The water rights transfer is a good way to let the agriculture and industry mutually support each other.

Now, water rights transfer in the Yellow River basin must get the approval of YRCC. There are five experimental units, two units are in Inner Mongolia autonomous region, and the other three units are in Ningxia autonomous region[5].

The seller of both experimental units in Inner Mongolia is the Yellow River south bank ID. The buyers are Inner Mongolia Dalate power house's □ expanding project and Endos Power & Metal Company project. The first concrete lining project of all 42 km canals of Endos Power & Metal Company has finished. And when the later project of all canals reforms is put in practice, the water of 2.2 million m^3 lost in transportation would be saved, which would meet Endos Power & Metal Company's 0.19 million m^3 water demand.

In recent years, Yellow River's south bank ID did not exceeds the 410 millionm^3 water allocated by YRCC at 2000[2]. Yellow River's south bank ID planed to build water saving projects to reduce the water loss in transportation, and can transfer the saved 130 millionm^3 water. However, Hetao ID is still in the state of exceedable water-intake, so water rights transfer is not permitted in this district.

3.3 Analyze of water rights transfer.

3.3.1 Powerful control of the administration

Yellow River Basin's water re-allocation is related to each province and each profession's benefit closely. A change in water re-allocation can affect the overall situation. So water re-allocation is controlled by powerful administration.

The "87 scheme", approved by the State Council Premier, has a high authority. YRCC which is subordinate to the Ministry of Water Resources (MWR) can cut volume when they authorize the water-intake. Water rights transfer is in the experimental stage, and it is controlled by the MWR & YRCC's strictly. MWR issued *Guidance idea about model of Yellow River water rights transfer in Inner Mongolia & Ningxia*; YRCC issued *Regulations of management implement on Yellow River water rights transfer.* The Yellow River water rights transfer management group was organized and a series of strict rules were made.

In order to let the water rights transfer follow the right path, Inner Mongolia issued *Original water rights scheme of Inner Mongolia* and *water rights distributing program.* It distributed the quota (87 schemes) to each region. And Inner Mongolia also issued *water rights transfer plan.*

The series of clauses above prescribe the water rights can only be transferred in the province. The time limit of transfer is 25 years. Water saving engineering is the temporary objective of water rights trading. The water transfer compensation includes the cost of water saving project, water measuring equipments, operation and maintenance.

From the analysis above, the process of water rights transfer is under the control of powerful basin and region administration. The administrator's willing is conveyed from top to bottom; the type of water management is bureaucratic management.[6]

3.3.2 Character of water rights transfer

In Inner Mongolia, The water rights are transferred between professions. It goes from agriculture to industry. It's a point to point transfer. In other words, an enterprise corresponds to an irrigation district.

The supply and demand between enterprise & irrigation district is a kind of market behavior. The water transfer compensation is a trade cost. But, we can not overlook that it is a market behavior under the powerful control of the administration.

4. Discussion

1) The objective of water rights trading is only limited in water saving engineering in Inner Mongolia now. Once all conditions is ripe, water saving in the field should be encouraged as trading objective.

2) Perfect water rights system should be established. Water rights should be allocated to each field and each farmer.

3) In Inner Mongolia, 0.27 billion m^3 of agricultural water can be transferred to industry in plan , but the problem of waste water from industry should be considered first.

4) When the industrial development makes agricultural farming obsolete, oasis will easily deteriorate.

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